

## CLAIMS

### WHAT IS CLAIMED IS:

1. A method for asynchronously transferring data, said method comprising:  
providing a buffer device;  
defining in the buffer device a plurality of buffer segments;  
5 filling respective ones of the buffer segments with data from at least one data source device operating in a respective clock domain; and  
upon any respective buffer segment being filled up, generating an indication of availability of the contents of said respective buffer segment to at least one data destination device operating in a respective clock domain, the clock domain of the at  
10 least one source device being distinct than the clock domain of the at least one destination device.
2. The method of claim 1 wherein upon the contents of the respective buffer segment being acknowledged as transferred to the data destination device,  
15 generating an indication of availability of that buffer segment for further refilling with data from the source device.
3. The method of claim 2 wherein the generating of the respective indications of buffer segment availability comprises determining the state of a  
20 respective buffer gauge signal uniquely associated with each buffer segment.
4. The method of claim 3 wherein the buffer gauge signal uniquely associated with each buffer segment comprises a single-bit signal.
- 25 5. The method of claim 4 wherein in the event the state of the respective buffer gauge signal indicates the buffer segment is full, the indication of availability of the buffer segment contents to the data destination device is triggered.

6. The method of claim 4 wherein in the event the state of the respective buffer gauge signal indicates the buffer segment is empty, the indication of availability of that buffer segment for further refilling of data from the source device is triggered.

7. The method of claim 1 wherein the defining of the plurality of buffer segments further comprises adjusting the number and/or size of the buffer segments to within a selectable range.

8. A data transfer controller for asynchronously transferring data by way of a buffer device, the controller comprising:  
a buffer-segment module configured to define a plurality of buffer segments in the buffer device, respective ones of the buffer segments being filled with data from at least one data source device operating in a respective clock domain; and

a segment-availability gauge configured to generate, upon any respective buffer segment being filled up, an indication of availability of the contents of the respective buffer segment to at least one data destination device operating in a respective clock domain, the segment-availability gauge being further configured to generate, upon the contents of the respective segment being acknowledged as transferred to the destination device, an indication of availability of that buffer segment for further refilling of data from the source device, the clock domain of the at least one source device being distinct than the clock domain of the at least one destination device.

9. The controller of claim 8 wherein the segment-availability gauge comprises a comparator configured to determine whether the state of a respective single-bit signal uniquely associated with a respective buffer segment is indicative of whether the respective buffer segment is full.

10. The controller of claim 9 wherein the comparator is further configured to determine whether the state of the single-bit associated with that buffer segment is indicative of whether the respective buffer segment is empty.

11. The controller of claim 8 wherein the buffer-segment module is further configured to dynamically adjust the number and/or size of the buffer segments.

12. A system for asynchronously transferring data, the system comprising:  
5 a data buffer device;  
a buffer-segment module configured to define a plurality of buffer segments in the buffer device, respective ones of the buffer segments being filled with data from at least one data source device operating in a respective clock domain; and  
a segment-availability gauge configured to generate, upon any respective  
10 buffer segment being filled up, an indication of availability of the contents of the respective buffer segment to at least one data destination device operating in a respective clock domain, the indication based on a single-bit signal uniquely associated with the respective buffer segment to indicate whether the buffer segment is full, the buffer segment-availability gauge being further configured to generate,  
15 upon the contents of the respective buffer segment being acknowledged as transferred into the destination device, an indication of availability of that buffer segment for further refilling of data from the source device, the indication based on whether the single-bit signal indicates the buffer segment as being empty, the clock domain of the at least one source device being distinct than the clock domain of the at least one  
20 destination device.

13. The system of claim 12 wherein the segment-availability gauge includes a register coupled to a counter configured to count data words transferred to a respective buffer segment, the segment-availability gauge further including a logic  
25 module coupled to the register and counter to set the respective signal indicative of that buffer segment being filled-up upon the counter reaching the maximum data word count for the buffer segment.

14. The system of claim 13 wherein the logic module is further responsive  
30 to an acknowledge signal from the data destination device to indicate transfer of each data word in any respective buffer segment to set the respective signal indicative of that buffer segment being available for further data refilling.